

## ***Interactive comment on “Estimating groundwater recharge from groundwater levels using non-linear transfer function noise models and comparison to lysimeter data” by Raoul Collenteur et al.***

**Rafael Schäffer (Referee)**

schaeffer@geo.tu-darmstadt.de

Received and published: 12 October 2020

### 1) General comment

#### Scientific significance

The topic of this manuscript is fitting well to the scope of HESS. The title is chosen appropriately (consider to substitute “Estimating” by “Estimation of”, please). My only, but massive, point of criticism of this manuscript concerns the scientific significance. Neither the abstract (cf. my comment on line 1-3) nor the two final sections (cf. my comment on line 469ff) give attention to the scientific significance in a proper way.

C1

What is the general value of this research? What is the real-world problem? What is interesting to people inside and outside this field? What about it is new? What is the specific problem, what do the authors achieve? After reading the whole manuscript this remains largely unclear to me. These questions should be addressed within the abstract, conclusion and maybe also partially within the introduction.

#### Scientific quality

The scientific methods and assumptions appear valid and clearly outlined to me. The results are convincing and support the interpretation. The description of the chosen approach is sufficiently complete, documented by several equations. As the authors provide the model code and software, fellow scientists are not only able to reproduce the results, but can do further developments as well. The authors give proper credit to related or previous works. The number and quality of references appears appropriate to me.

#### Presentation quality

Besides section 5.4, the overall presentation is well structured and clear. The English is easy to read and to understand. The manuscript is nearly free from technical mistakes. I have only two major remarks concerning abbreviations and units (see comment on line 80 and figure 7 in technical corrections). Some minor suggestions are given to improve the readability of some figures.

### 2) Specific comments

Lines 1-3: The abstract starts with a description of the specific topic already. Begin the abstract with two, three sentences tackling the large general topic of wide interest and the importance (“real world problem”) of this study like you did in lines 16/17. Interest readers which are not that familiar with the topic might need this short introduction.

Lines 73-74: Where is the research station Wagna located exactly? Refer to a town, city or valley, maybe draw a small map. Please provide some more geographic and climatic

C2

information like altitude, slope (if applicable), annual average temperature, sunshine hours etc. As you state in lines 64-66, your idea is to provide a proof-of-concept with a single location. A good description is needed to evaluate how representative this location is and if this location is comparable to other sites.

Figure 1: Add the used symbols to the caption (e.g. precipitation p. . .) or describe the subfigures a, b, c and d separately.

Lines 83-89: This paragraph should be placed earlier in this chapter.

Figure 3: Also include  $E_t$ ,  $s/E_{max}$  and  $R$  in the caption.

Lines 267-268 and 279-284: The linear and non-linear models have eight, the lysimeter model five parameters. Did you check the influence of parameter variations? I could not get/understand, if you performed a sensitivity analysis (Figure A3?). Some parameters might be more important than others. It would be interesting to know if the variation of some parameters can be neglected, because they have a rather low influence on the model results.

Figure 6: What about using in subfigures b, c and the same colours for linear, non-linear and lysimeter as in subfigure a? I would prefer to use the same scale for the y-axis, even if this makes the figure a little larger.

Lines 390-391: Does it make sense to introduce a crop depended correction factor to receive better fits? Could the specific plant behaviour be handled similar to a hydrological process (cf. lines 429-430)?

Lines 469ff: I would be happy to see the title of this section renamed. What about "Relevance of this study", "impact" or "outlook". The latter would make more sense if matched with the conclusion. You are giving short outlooks in lines 416-417, 442-446 and 468 as well as a final outlook in lines 505-509. Wouldn't it be better to condense these statements in one paragraph at the end? What about the overall benefit of your research? I have not the impression that you are bringing your

C3

points across very well. Especially in the light of the two sentences in line 470 ("only one of many similar alternatives") and 472/473 ("other comparable non-linear model setups. . . perform in a similar manner"): Explain, what is the relevance of your research? What is new/special/innovative? What problem is solved/improved? Sell you product, sell your research in a better way! Ok, there is one statement ("TFN model improved. . .significantly") in line 496-497, but why is this important?

Line 513: References to the Durbin-Watson test and the Ljung-Box test seems appropriate to me here.

3) Technical corrections

Line 80 and elsewhere: This is maybe more a matter of taste, I prefer to us "a" instead of "yr".

Lines 84/85: " $\pm 2.5$  m" in one line

Figure 2: Wouldn't it be better to place figure 2 within section 3.3?

Figure 3: The font size is rather small.

Line 244:  $DW = 2$

Figure 4: Enlarge the size of this figure. Caption: Durbin-Watson (DW) statistics. . .

Line 288: one day

Lines 304, 308, 309, caption table 1 and elsewhere: Sometimes you write "10" and sometimes "ten". I would appreciate if you could unify this.

Figure 6: The position of the box is a little bit unfavourable. Describe the box content shortly in the caption.

Figure 7: "a" or "yr" instead of "y"

Figure 8: Your colour code for the lysimeter was red-brown in the previous figures. I suggest that you maintain the same colours.

C4

Line 400: one

Line 451: delete "of"

Lines 461-463: Rephrase one of the sentences to avoid three times "the" at the beginning.

Figure A1: Caption: add "(ACF)" after autocorrelation function.

---

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2020-392>, 2020.